

Aquaculture in Alberta

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Silver Carp (*Hypophthalmichthys molitrix*) to be Tested in Alberta ... for algae control!



Silver Carp (*Hypophthalmichthys molitrix*) are to be researched in Alberta for algae control. According to Ron Beck, aquaculture biologist for Alberta Agriculture, Food & Rural Development, there is potential that silver carp could help reduce certain algae problems in dugouts.

Silver carp are native to China. Europeans have raised silver carp for more than twenty five years. Reservoirs in the United Kingdom and in Israel have been stocked with silver carp for biological control of blue-green algae.


"These fish" says Beck, "feed on the microscopic plant life or phytoplankton, something that their distant cousins, the grass carp do not.

However, we want to make sure that these fish do not upset the ecosystem balance by feeding on the beneficial microscopic animal life or zooplankton."

An initial two year study is being undertaken by Alberta Agriculture, Food and Rural Development, in cooperation with the Alberta Agricultural Research Institute, Prairie Farm Rehabilitation Administration, Eastern Irrigation District, and the Lethbridge Community College.

Triploid silver carp will be imported from Arkansas this summer. These small triploid fingerlings will be housed in a quarantine area at the Aquaculture Facility in Lethbridge.

The fish will be subjected to disease testing and triploid verification to ensure health and sterility.

The study will document how effective silver carp are in reducing algae problems. "At the same time," according to Beck, "we will be learning how well these fish survive and grow in Alberta's climate." The silver carp will be tested within algae enriched ponds under controlled conditions of a greenhouse environment 

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TRANSPORTING LIVE FISH



“Many commercial fish suppliers now request that customers pick up their own fish for stocking,” says John Bjornson, president of the Alberta Fish Farmers Association. This reduces transportation charges, customer waiting time and allows suppliers to spend more time at their facility with their fish.

Transporting live trout can be done with equipment found around the farmyard or borrowed from a neighbor. Check with your trout supplier first, to see what is recommended.

1. Shipping Containers - can vary from a 5 gallon plastic bag, to a 45 gallon polyethylene barrel, up to a large agricultural water tank. Make sure the container you use has not previously held toxic chemicals. Some fish suppliers provide you with plastic bags and barrel liners. These eliminate contamination, reduce water spillage, and enable extra oxygen to be added.

2. Oxygen - fish need to breathe oxygenated water. You can use oxygen supplied from a small 12 volt comp-

ressor that plugs into your lighter or from an oxygen/acetylene welding bottle. Oxygen cylinders will require an oxygen pressure regulator to control flow.

Run the oxygen through a poly or rubberized air line (minimum 3 metres long). Install an air stone or diffuser on the end of the line going into the water. (Your trout supplier will often have these items in stock.)


For small fish deliveries and short travel distances, a supply of oxygen might not be necessary. Use an airtight container and add extra oxygen.

“Once the fish are loaded into your transportation tank, DON'T WASTE TIME. Get your fish to your pond as soon as possible. When traveling considerable distances, check the fish every hour. If they are gulping at the surface, they need more oxygen. Only increase oxygen by a small amount - too much

can be harmful. The fish should be spread evenly from the top to bottom of the tank and not appear overly excited,” states Bjornson.

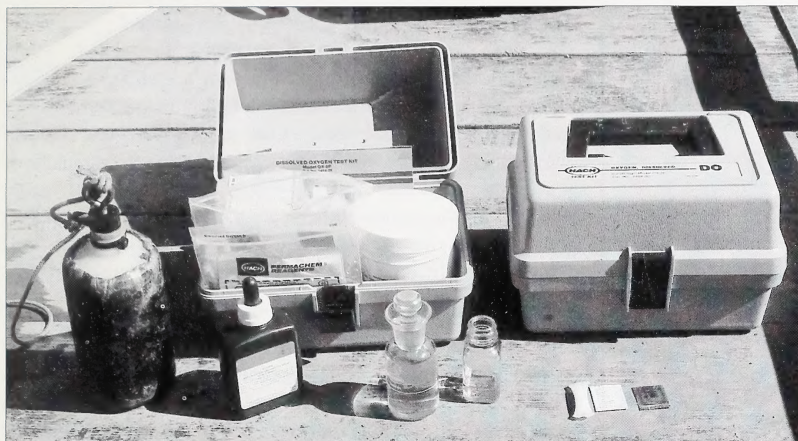
Once at the pond, check the water temperature of the transport tank. Compare to the pond, checking the pond's temperature as far out as possible, since shoreline temperatures can be several degrees higher than the main pond.

No need to get wet, just tape one end of an 8 metre piece of string to your thermometer. About 1 metre from the thermometer, affix a cork or some other floating device. Hold the other end of the string and throw the thermometer into the pond. Let it sit for 5 minutes to allow for an accurate reading. If the pond temperature is within 3 degrees Celsius of the transport tank, then dip out 10 fish and place them in the pond. If they disappear quickly, then transfer the rest of the fish in. If they hang around the shoreline and appear sluggish, then you need to exchange some water.

Exchange about 10% of the transport tank water with the pond water. Wait 5 minutes and repeat this procedure, until about 75% of the tank water has been exchanged. Again, move 10 fish from the transport tank to the pond. At this point, there shouldn't be any problems. Only rarely does the second try of moving 10 fish not work. “It's possible,” concludes Bjornson, “that the pond is polluted or has a very low oxygen concentration.” Phone your supplier for additional information 

By John Bjornson, of Alberta Trout Growers in Tofield, telephone (780) 662-3474, who has used this method for stocking over one million fingerlings in the past ten years, with a 100% success ratio.

Check Your Oxygen Levels



A simple dissolved oxygen kit containing reagent, glass containers and powder ampules. Optional water sampler (at left) is a 1 litre stopper bottle weighted with lead.

An adequate amount of dissolved oxygen in water is crucial for fish survival. If you operate a fish farm, you know what aeration means. It includes testing the water to ensure proper oxygen is mixed into it. Various kits are available to determine dissolved oxygen amounts in water. It is hoped this article will assist you in determining what type of kit is best for you.

Generally, test kits costing just over \$100 are adequate for pond /dugout samples. These "cheaper kits" usually require mixing ingredients, such as powder pillows, ampules, or other reagents, causing some inconvenience. There are field kits that cannot handle low oxygen readings or heavily stained waters. Check specifications. The amount of dissolved oxygen required for trout is generally 4 to 5 mg/L (4-5 parts per million). A reading of less than 2 mg/L usually means "fish will die."

Because oxygen is constantly used up, every water sample must be tested as

soon as possible, to ensure accuracy. When testing for dissolved oxygen, consider how deep the water is, how many samples are needed, and at what depths the samples should be taken. Generally, water at the bottom of deep ponds is poorly circulated, tends to collect organic matter and is oxygen deficient. Water, sampled from the surface, is in contact with the atmosphere and receives natural aeration. Dissolved oxygen levels will be substantially higher at the surface of a deep pond or dugout than at the bottom. Time of day can be important, as oxygen levels are at their lowest during early morning hours.

Results obtained from sampling water at the surface won't lie but they won't tell you the whole truth. The number of samples you chose will depend on the type of kit you are using (is it user friendly), the depth of your water, and the condition of your fish. Unfortunately, unless you sample the water at various points, you will not know what the oxygen situation is throughout the pond.


What to do? A recreational fish culturist might consider purchasing the titration dissolved oxygen kit, because of cost and low sample requirements. If so, consider making your own water sampler to collect water at any determined depth.

More expensive electronic dissolved oxygen meters, have actual probes that allow you to sample at different depths and read the dissolved oxygen directly without mixing chemicals. Dissolved oxygen meters can cost between \$800 to \$2000. They are usually temperature compensated and adjustable according to elevation or salinity.



Hand held electronic oxygen probe allows for quick readout at various depths.

This method saves time and can increase your willingness to monitor the quality of your operation's water without a lot of stressful work.

For more information on oxygen testing, contact the Aquaculture Section or any Regional Engineering Technologist with Alberta Agriculture, Food and Rural Development 

Steven Madden, Regional Engineering Technologist, in Fairview, telephone (780) 835-2291

Aquaculture Section Update ... by D. Lloyd

One of the primary reasons for writing this column is to share information about AAFRD's aquaculture section's current commitments and future priorities. I will highlight the major activities and issues affecting aquaculture development here in Alberta.

Round Table on Aquaculture

Recently I attended the first Round Table on Aquaculture hosted by Honorable Gilbert Norm (Ottawa PC-MP) and Secretary of State for Agriculture and Agri-Food, Fisheries and Oceans Canada. The two day session addressed: the current state of aquaculture in Canada, where the industry is heading in five to seven years and implementation of the Federal Aquaculture Development Strategy.

Other issues scheduled for further discussion include: fish health disease policy, lack of disaster insurance, difficulties in obtaining financing for start-up, risk credit, lack of value added support, and slow decisions on policy. I came away from the meeting with a feeling that our Federal Government will move quickly to address the industry's priority issues.

Aquaculture Effluent Impact Study

This one year study proposes to characterize the effluent leaving five of Alberta's aquaculture facilities. Information generated from this assessment will provide a baseline to measure nutrient loadings from different fish production facilities. This data will be used to develop appropriate effluent standards that could be incorporated into the Provincial Code of Practice for the aquaculture industry. Partners in the study are the Environmental Sciences Division of Alberta Environment, Alberta Agriculture, Food and Rural Development and the aquaculture industry through the Alberta Fish Farmers Association.


The Water Act

The new Water Act came into effect January 1, 1999, regulating the division of water from surface and groundwater sources by a variety of methods, including statutory rights for traditional agricultural uses. Our section receives a lot of questions on how the new Act applies to both existing and new aquaculture ventures. Alberta Environment staff with assistance from the aquaculture section are producing a "Fact Sheet" that will provide answers to many of the questions coming from the industry.

Risk Assessments

The risk assessment on Bigmouth Buffalo Fish was successfully completed. The species has now been added to the Ministerial Regulations as a permitted species for a Commercial B license holder (with conditions). AAFRD is currently coordinating two risk assessments for the proposed introduction of indoor rearing of American Eels and Apple Snails for the food market. No decision has been released in either assessment.

Whirling Disease

The Whirling Disease Task Force Committee and the accompanying expert panel continue to work through the risk assessment process. The 1999 testing of the wild salmonid population will be completed in the fall of this year. To date, no infected fish have been detected. The committee will forward recommendations to the respective Ministries upon completion of its tasks 

Duncan Lloyd, Manager of AAFRD's Aquaculture Section in Lethbridge, telephone (403) 381-5539

Would you like to become a member of the Alberta Fish Farmers Association? Do this by completing the enclosed form and submitting to the treasurer and membership chairman, Darwin Monita.

Help the industry by voicing your concerns and being instrumental in planning our future direction. Through your assistance, the AFFA can sponsor seminars and workshops, work with government legislators, and network with other aquaculturists, throughout the continent.

The AFFA is currently working on a code of ethics which will recognize members as diligent. This will improve customer service and in the long run benefit the AFFA member/supplier. Members of this association liaise and disseminate timely information and research. This directly affects our businesses and practices.



**ALBERTA FISH FARMERS
ASSOCIATION**



Your Name _____

Address _____

Town/City _____

Postal Code _____ Phone _____

☐ \$ 10.00 Associate Membership

☐ \$100.00 Full Membership

Mail with cheque to:

Alberta Fish Farmers Association
C/O Greenview Aqua-Farm
Box 4, Site 22, RR7
Calgary, Alberta T2P 2G7

Alberta Public Waterbody Stocking Contracts

... by Commercial Fish Farmers

In 1995, an enhanced rainbow trout stocking program was initiated within the white (agricultural) zone of Alberta. One dollar from each fishing license provides funding for the program. Each year, about 100 different ponds are stocked, using commercial aquaculturists to grow and supply the rainbow trout. This helps all of the Province's anglers in several ways. First, public hatcheries can devote their time to managing the natural trout stocking areas in the west. Second, it spreads trout fishing and resulting recreational use throughout the Province, helping reduce pressure on the "green" zone. Third, anglers can catch "keeper" sized fish out of these ponds, immediately after stocking, unlike most other Provincially stocked waters.



A random sample of loaded fish is examined and measured.

Responsibility for managing this enhanced rainbow trout stocking program is now with the Alberta Conservation Association (A.C.A.). Previously it was through Alberta Environment, Fisheries Management Division. In 1999, there were ten contracts awarded to four fish farmers for stocking 20 cm rainbow trout in public waterbodies. The number of ponds awarded to each contract varied from 4 to 16 (10,500 to 14,500 fish). Total contracts were for 133,000

rainbow trout, with a value of \$187,000. "Contract price per fish averaged about \$1.40," says Terry Clayton, A.C.A. Provincial Co-ordinator.

Minimum acceptable length for stocking is 20 cm. Fish size for each stocking is determined at the grower's facility during time of loading. This is done by A.C.A. staff. A random sample of the loaded fish is subsequently taken (up to 100 fish). An approved observer must be present at the final lake stocking. Fish farmers who stock fish below 20 cm are penalized, depending on the average size of the sample.



Trout are inspected on-site, during day of loading.

Most trout stockings occur in the spring, although some contracts do allow for fall stockings.

"An effort is made to request bids and award contracts a year and a half prior to fish being stocked. Contracts have already been awarded for 1999 and the year 2000 stockings. This allows growers to plan ahead, obtain eggs and rear fish. Contracts for the year 2001 stocking will be awarded in October of 1999," concludes Clayton.

For more information on contracts to stock rainbow trout in public waterbodies, please contact Terry Clayton of the Alberta Conservation Association (A.C.A.) in Lethbridge. Telephone 382-4362 or write to A.C.A., 2nd Floor YPM Place, 530 - 8th Street South, Lethbridge, AB T1J 2J8 🐟



A designated observer views the release of fish into the lake.

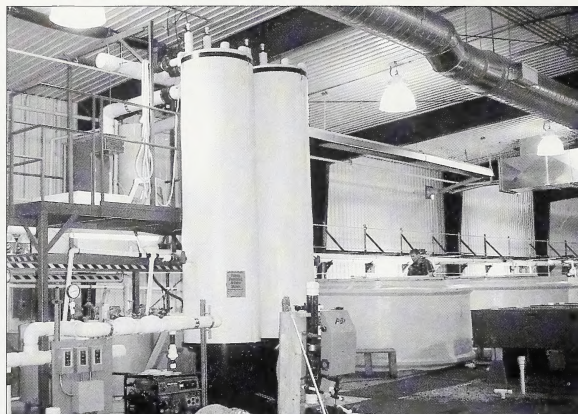
Raising Fish with a ... RECIRC. SYSTEM

Use of recirculating systems for fish culture has been increasing here in Alberta. "They reduce water needs and waste discharge, while maintaining consistent year round temperatures" says Svat Jonas, professional engineer with AAFRD's aquaculture section. Technical aspects of these systems are outlined here.

Let's start with the building. Alberta's extreme weather conditions make it very difficult to build an outdoor recirculation system. Choose a spacious building, preferably having a high ceiling - 4.5 m or higher (15 ft) and well insulated. Because of excessive moisture, the building needs proper ventilation. Floors can be made of sand and fine gravel, although concrete is ideal.

The fish culture or growing tanks are key components, available from commercial suppliers or custom producers. Material can be polyethylene, concrete, steel, fibreglass, etc., with diameters varying from 2.4 m to 10 m (8 - 30 ft). Round tanks where water enters from the outside perimeter and drains into the middle are the easiest to clean. Each tank must have its own inlet and outlet. The water inlet for each tank should be submerged, to avoid loss of injected oxygen. Water velocity should not exceed 0.3 m (1 foot) per second. Acceptable water depth for each tank is obtained by dividing tank diameter by 10 (for minimum depth) and by 5 (for maximum depth). For a culture tank with a 4 m diameter you should have a water depth of 0.8 to 0.4 m ($4 \div 5$ & $4 \div 10$).

The CARRYING CAPACITY (CC) of a system is limited by oxygen consumption and the accumulation of metabolic wastes. Both factors are related to fish numbers and the amount of food eaten. Therefore CC must be calculated in the design of your system. This is accomplished by: 1) knowing the maximum weight (kg/m^3 or lb/ft^3) or number of fish that can be raised in any given tank with a specific volume of water (often referred to as DENSITY); 2) knowing the



Indoor facility with two biological filters (center) and fibreglass culture tanks (right side).

maximum weight or number of fish that can be raised in a system relative to water flow (often referred to as **LOADING**, expressed as $\text{kg}/\text{L}/\text{min}$ or $\text{lb}/\text{gal}/\text{min}$). Both of these factors are required to establish the CC the system can support. For example, a 3 m (10 ft) diameter circular tank may support 290 kg (640 lb) of fish (**DENSITY**) based on water volume. However, in order to sustain the fish at that density, a continuous supply of water (L/min or gal/min) must be delivered to provide the required oxygen and removal of fish wastes. If water flow is limited, your system may hold only a fraction of the calculated **DENSITY**. Numerous "Models" are available to guide you through these calculations. However, you may want to contact an experienced fish culturist or aquaculture engineer for further assistance.

Another important component is a self cleaning mechanical filter to remove large particles of uneaten food and feces. Often new producers do not realize the importance of having this particular piece of equipment. Although initially expensive, a self cleaning filter pays for itself very quickly, through savings in manpower," states Jonas. Using other particulate filters is acceptable, such as sand filters used for swimming pools, but these require daily (sometimes hourly) intensive maintenance.

Another crucial component is the biological filter. This breaks down ammonia into a non toxic form. Many


different types of biological filters and filter media are available. The latest technology uses fluidized sand filters. These are currently the most efficient filter type, using silica sand, lifted up by a stream of water, into suspension. The whole surface of each tiny grain of sand supports bacteria that cause ammonia to transfer into nitrites and later harmless nitrates. The amount of fish being raised determines the size of your biological filter.

Pumps are also important, since water needs to circulate.

The size and number of pumps depends on flow rate calculations taken from fish loading and feeding rate information.

Every recirculation system must have supplemental oxygen injected into the water flow. As with pumps, careful calculations are necessary to properly size the oxygen generator. Installing an oxygen contactor can further improve oxygen absorption into the water. Depending on design, contactors can increase absorption efficiency from 60% to 90%.

Intensive recirculation systems need to deal with unwanted carbon dioxide production. "Installing a carbon dioxide stripper," says Jonas, "will solve this problem." Many different CO_2 strippers are available, some easily designed at home.

In conclusion, recirculation systems are expensive. A careful analysis and business plan should be done before you spend money to build one. Many components can be made "at home" by individuals with patience and handyman skills. However, some components such as biological filters and self cleaning particulate filter systems should be obtained from professional suppliers or build to exact specifications 

For more information on recirculation systems, contact Svat Jonas, professional engineer with AAFRD's, Aquaculture Section in Lethbridge, tel. (403) 381-5170.

Arctic Charr Culture in a Controlled Environment



Arctic Charr was selected as a promising species for aquacultural diversification in Alberta because of its market price, its suitability for intensive culture and its preference for cold water (thus minimizing heating requirements for water). At the Alberta Research Council (ARC) in Vegreville, it was decided to combine ongoing controlled environment aquaculture research with an attempt to diversify species.

In December 1997, Icy Waters International Inc. supplied eggs of the Yukon Gold® strain which were incubated in Heath trays at a water temperature of 5° C. This technique allowed a hatching success rate of over 95%. Experiments were set up in eight tanks to test the effects of photoperiod, light intensity, and the availability of a hiding place (presence or absence). This was measured through charr fry performance by changes in growth rate, condition factor, and feed conversion efficiency. Trials were repeated at three growth stages. Statistical procedures allowed the major effects and first-order interactions to be evaluated and recommendations to be developed.

As the charr grew to the fingerling stage, they were graded and moved to a four-system pilot facility that had previously

been used for culturing rainbow trout. The effects of system design and culture density were observed in relation to charr performance. Fin condition of the Arctic charr remained excellent. Virtually, no aggressive behaviour was observed during the trials. A large variation in growth rates was apparent amongst the charr, even though they were graded periodically.

A demonstration-scale facility was designed and constructed for Arctic charr growout. It was built on a two-level platform and enclosed in a greenhouse style, double layered, polyethylene structure. The design reflects the most promising technologies observed during the pilot study, including a fluidized sand biological filter, a bubble contactor for oxygenation and ozonation, a two stage clarifier, and an off-gas recovery system. The culture unit is a 4 metre diameter tank that will accommodate over a tonne of Arctic charr when the system is fully acclimated.

As of May 1999, after sixteen months of growth, the largest of the cultured fish weighed approximately one kilogram.

The concept of raising fish to market size within controlled environment facilities is relatively new in Alberta. By choosing a species suited to intensive culture and providing adequate supporting technology to ensure ideal growing conditions, the Alberta Research Council hopes to demonstrate a practical diversification opportunity for prairie farms.

"Several visitors, after observing large fish in the grow-out tank, have asked when we will be hosting a charr barbecue," states Wendel James. "If all goes well, that may occur before the end of the millennium!"

By Wendel James, research scientist, Alberta Research Council, in Vegreville, telephone (780) 632-8271.

The editor notes that Arctic charr are also being researched by AAFRD in outdoor dugouts.





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COURSES, PUBLICATIONS & EVENTS

Courses

One aquaculture course "Broodstock Management" is again being offered this fall by AAFRD in conjunction with the Lethbridge Community College and the Alberta Fish Farmers Association.

This course is planned for November, in Lethbridge, scheduled to coincide with spawning activities at a local hatchery. This course is for those who wish to raise their own brood fish, spawn them and obtain young. The course will cover egg stripping, incubation, larval husbandry, manipulation of fish to produce sterility, and brood fish conditioning and spawning. Enrollment is limited to 12 students.

Another course "Aquaculture System Design," is being planned for spring of the new year, in Lethbridge. It will consider practical intensive and extensive aquaculture facility design and function. Essential aquaculture equipment will also be discussed. This two day course, is planned to follow the annual "Basic Principles of Aquaculture" course.

To obtain more information on these courses, or to pre-register contact: Eric Hutchings, of the AAFRD's Aquaculture Section in Lethbridge toll free by dialling 310-0000, then 381-5574, or if dialling direct, area code (403) 381-5574.



Kathryn Kossmann from the Province's Raven Brood Trout Station explains egg production to the "Basic Principles of Aquaculture" 1999 class.

Publications

A number of aquaculture publications and video tapes are now available on short-term loan through your local AAFRD office. Most are maintained with the Aquaculture Section in Lethbridge.

Fact sheets from the AAFRD office near you, or on our Internet website include:

Constructing Dugouts for Fish. Agdex 485/716-1

Fish Culture Licenses. Agdex 485/84-1

Screening Your Fish Pond. Agdex 485/87-1

Biological Weed Control in Alberta using Triploid Grass Carp. Agdex 485/641-1

Freshwater Aquaculture Industry. Ag -Venture series Agdex 485/830-1 (under review).

Aquaculture Profit\$... for a rainbow trout intensive fingerling enterprise. Agdex 485/821-1

Events

September 22-25.

Aquaculture Marketing Seminar 1999. Asheville, North Carolina - is dedicated exclusively to marketing and includes niche and byproduct markets. Contact Beth Wiseman, Aquaculture Magazine in North Carolina at (828) 253-0677 or Email aquamag@ioa.com

October 26-29.

Aquaculture Canada '99 and Pacific Exchange, Victoria Convention Centre, Victoria,

B.C. Conference and trade show with Aquaculture Association of Canada annual meeting. Contact Linda Townsend at (250) 741-8708 or Email show@nbnet.nb.ca

November 14-17. Marketing & Shipping Live Aquatic Products '99, 2nd International Conference and Exhibition, recommended for fish farmers involved in the ornamental and aquatic food industry. Contact John B. Peters at (206) 855-9506 or Email JohnBPeters@compuserve.com

December 7-9. 50th Annual Pacific Northwest Fish Culture Conference. This conference is a presentation of information on the art and science of fish culture. Contact Ray Brunson, Olympia Fish Health Centre in Olympia, WA at (360) 753-9046 or Email Ray_Brunson@fws.gov

Editor's Notes

Only two issues of Aquaculture in Alberta will be produced in 1999. If you would like to submit articles, provide us with input or be placed on the mailing list, contact Eric Hutchings, the editor, in Lethbridge at (403) 381-5574 or use the following E-mail address eric.hutchings@agric.gov.ab.ca

The Internet address for Alberta Agriculture, Food and Rural Development's "Ropin the Web" Home Page is

www.agric.gov.ab.ca This home page contains aquaculture information (fact sheets, fingerling suppliers lists, aquaculture links, etc.)

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